

What is claimed is:

1. A method of modifying a wireless protocol stack on a first device, the protocol stack comprising a plurality of protocol layers, the protocol layers comprising one or more existing software components, the method comprising the steps of:
 - providing the protocol stack in a run-time system on the first device;
 - downloading at least one updated software component to the first device;
 - loading the at least one software component into the run-time system; and
 - replacing one or more of the exiting software components with the at least one updated software component to update the protocol stack on the fly while the protocol stack is running in run-time.
2. The method of claim 1, wherein the existing software components and the at least one updated software components comprise platform independent software instructions.
3. The method of claim 2, wherein the platform independent software instructions comprise Java™ software instructions.
4. The method of claim 1, wherein the at least one updated software component comprises an update to at least one of the protocol layers.
5. The method of claim 4, wherein the at least one updated software component comprises an update to all the protocol layers.
6. A wireless device, comprising:
 - a baseband circuit, the baseband circuit receiving functionality as transmitted in object form by a second device; and
 - a platform independent protocol stack, the platform independent protocol stack transferring the functionality from the baseband circuit to the wireless device such that the wireless device may utilize the functionality on the fly during run-time and in the object form transmitted by the second device.
7. A first device operating with a first operating environment, the first device comprising:
 - a memory;
 - a protocol stack, the protocol stack residing in the memory, the protocol stack comprising executable Java-like functionality, the executable Java-like functionality modifiable on the fly; and
 - execution means for executing the executable Java-like functionality.

8. The first device of claim 7, the first device further comprising a baseband circuit, the baseband circuit receiving the executable Java-like functionality and providing the executable Java-like functionality to the protocol stack.
9. The first device of claim 7, the executable Java-like functionality selected from a group consisting of software instruction, software module, software layer, API, object code file, software interface to hardware, class file, class file archive, security manager, file transfer protocol, object exchange protocol (OBEX), TCP/IP stack, synchronization profile, object push profile, dial-up networking profile, bug fix, code patch, and LAN access profile functionality.
10. The first device of claim 8, the executable Java-like functionality received from a second device operating under a second operating environment, the second operating environment differing from the first operating environment.
11. The first device of claim 7, the protocol stack comprising a Bluetooth™ compatible protocol stack.
12. The first device of claim 7, the first device comprising a cellular phone.
13. The first device of claim 7, the first device selected from a group consisting of: a personal digital assistant, wireless basestation, network access point, gaming device, music player/recorder, remote control, industrial automation control device, personal organizer, wireless audio device, and sensor interface.
14. The first device of claim 7, the execution means executing the executable Java-like functionality as micro-instructions.
15. The first device of claim 8, the baseband circuit comprising a Bluetooth™ baseband circuit.
16. The first device of claim 10, the first operating environment comprising a virtual machine, and the second operating environment selected from the group consisting of a Windows operating environment, a Unix-based operating environment, a Macintosh operating environment, a Linux operating environment, a DOS operating environment, a PalmOS operating environment, a virtual machine environment, and a Real Time Operating System operating environment.

17. The first device of claim 10, the first operating environment comprising a Windows operating environment, and the second operating environment selected from the group consisting of a Unix-based operating environment, a Macintosh operating environment, a Linux operating environment, a DOS operating environment, a PalmOS operating environment, virtual machine and support software operating environment, and a Real Time Operating System operating environment.
18. A first device operating under a first operating environment, the first device comprising:
means for transferring a protocol stack to the first device from a second device operating under a second operating environment; and
a baseband circuit, the baseband circuit interacting with the protocol stack to transfer information between the first device and the second device.
19. The device of claim 18, the first operating environment differing from the second operating environment.
20. A first device operating under a first operating environment for communicating with a second device operating under a second operating environment, the first device comprising:
means for transferring software instructions from the second device to the first device; and
means for executing the software instructions dynamically at run-time.
21. The first device of claim 20, the means for transferring comprising a communications protocol stack.
22. The first device of claim 21, the means for executing the software instructions comprising an application layer program.
23. The first device of claim 22, the protocol stack comprising semi-compiled/interpreted instructions.
24. The first device of claim 22, the software instructions comprising byte-codes.
25. The first device of claim 24, the first operating environment differing from the second operating environment.
26. The first device of claim 25, the first operating environment comprising a virtual machine and software support layer, and the software instructions originating from a second operating environment selected from the group consisting of: a Windows operating environment, a Unix operating environment, a Macintosh operating environment, a Linux

operating environment, a DOS operating environment, a PalmOS operating environment, and a Real Time Operating System operating environment.

5 27.The first device of claim 21, the first device comprising a wireless device.

28.The first device of claim 27, the software instructions comprising Java™ byte-codes.

10 29.The first device of claim 20, the software instructions comprising a protocol stack.

15 30.A method of communicating between a first wireless device operating under a first operating environment and a second wireless device operating under a second operating environment, comprising the steps of:
downloading platform independent software instructions in executable form from the second device to the first device; and
executing the instructions on the fly.

20 31.The method of claim 30, the software instructions comprising a protocol stack.

32.The method of claim 30, the step of downloading software instructions comprising downloading over a wireless medium.

25 33.The method of claim 32, the software instructions comprising Java-like software instructions.

30 34.The method of claim 31, the protocol stack comprising a platform independent protocol stack.

35 35.The method of claim 33, the first operating environment differing from the second operating environment.

36.A wireless device operating with a first operating environment for communicating with other devices operating with a second operating environment, comprising:
a storage location;
means for downloading functionality existing on the other devices to the storage location;
40 a processor; and
an application program, the application program running on the processor; the application program utilizing the functionality on the fly at run-time.

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37. The wireless device of claim 36, the functionality comprising a protocol stack.
- 5 38. The wireless device of claim 36, the functionality comprising two or more protocol stacks.
- 10 39. The wireless device of claim 36, the means for downloading comprising a communications protocol selected from the group consisting of: Bluetooth™, GSM, 802.11, 802.11b, 802.15, WiFi, IrDA, HomeRF, 3GPP, 3GPP2, CDMA, HDR, and TDMA, UMTS, GPRS, I-mode, IMT-2000, iDEN, Edge, Ethernet, HomePNA, serial, USB, parallel, Firewire, and SCSI protocols.
- 15 40. The wireless device of claim 37, further comprising a baseband circuit, the baseband circuit communicating with the other devices in cooperation with the protocol stack.
- 20 41. The wireless device of claim 40, the means for downloading functionality comprising a cellular phone communications protocol, the protocol stack downloaded utilizing the cellular phone communications protocol.
- 25 42. The wireless device of claim 41, the cellular phone communications protocol selected from a group consisting of TDMA, CDMA, GPRS, GSM, EDGE, UMTS, I-mode, IMT-2000, iDEN, and 3GPP protocols.
- 30 43. The wireless device of claim 36, the means for downloading functionality comprising a communications protocol selected from a group consisting of Bluetooth™, IEEE 802.11, 802.11b WiFi, IEEE 802.15, IrDA, and HomeRF protocols.
- 35 44. The wireless device of claim 36, the functionality selected from a group consisting of Java™ byte-code, Java-like software instruction, profile, software module, software layer, API, object code file, class file, class file archive, application data, bug fix, patch, and software interface to hardware functionality.
- 40 45. The wireless device of claim 36, the first operating environment comprising a virtual machine, and the functionality originating from a second operating environment selected from the group consisting of: a Windows operating environment, a Unix operating environment, a Macintosh operating environment, a Linux operating environment, a DOS operating environment, a PalmOS operating environment, a virtual machine operating environment, and a Real Time Operating System operating environment.
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46. A wireless device operating under a first operating environment, comprising:
- a processor;
 - a baseband circuit, the baseband circuit receiving software instructions stored in object form on a second device; and
 - a platform independent protocol stack for transferring software instructions from the baseband to an application program running on the processor, the application program executing the software instructions in the object form stored on the second device without compilation of the software instructions.
47. A computer readable medium comprising instructions for transferring executable functionality from a baseband circuit, including instructions for:
- converting the executable functionality according to a communications protocol; and
 - providing the converted executable functionality directly to at least one application program at run-time.
48. The medium of claim 47, the executable functionality selected from a group consisting of Java™ byte-code, Java-like software instruction, profile, software module, software layer, API, object code file, class file, class file archive, application data, bug fix, patch, and software interface to hardware functionality.
49. The medium of claim 47, the at least one application program comprising at least one platform independent protocol stack.
50. The medium of claim 49, the at least one platform independent protocol stack comprising at least two separate platform independent Java™ based protocol stacks.
51. The medium of claim 47, wherein the executable functionality is received by the baseband circuit in object form, and wherein the converted executable functionality is provided to the at least one application program without compiling the executable functionality.
52. A storage device operatively coupled to a processor and a Bluetooth™ baseband, comprising: a platform independent Bluetooth™ protocol stack, the Bluetooth™ protocol stack for operating on Bluetooth™ packets, the packets being transferred between an application executing on the processor and the Bluetooth™ baseband, the protocol stack comprising Java-like software instructions.

53. A wireless device comprising:
a processor;
means for storing information;
a baseband circuit, the baseband circuit for transmitting and
5 receiving the information; and
a wireless protocol stack for transferring the information between the
baseband and an application program executing on the processor,
the protocol stack residing in or on the means for storing
information, the protocol stack comprising Java™
10 software instructions.
54. A device comprising:
a processor;
means for storing information;
15 a communication circuit, the communication circuit transmitting and
receiving the information as binary information; and
a platform-independent communication protocol stack, the platform-
independent communication protocol stack transferring
20 the binary information between the communication circuit and an
application program executing on the processor, the protocol
stack residing in or on the means for storing information, the
protocol stack comprising a plurality of executable software
layers, each layer providing differing functionality, wherein one or
25 more of the layers are dynamically configurable on the fly at
run-time.
55. The device of claim 54, wherein the communication circuit comprises
a baseband.
- 30 56. The device of claim 55, wherein the baseband is selected from the
group comprising: Bluetooth, IEEE 802.11, 802.11b, WiFi, GSM, IEEE
802.15, IrDA, 3GPP, 3GPP2, CDMA, HDR, UMTS, GPRS, I-Mode, IMT-
2000, iDEN, EDGE, or TDMA basebands.
- 35 57. The device of claim 54, wherein the communication circuit is selected
from the group comprising: Ethernet, HomePNA, HomePlug, serial,
USB, parallel, Firewire, and SCSI communication circuits.
- 40 58. A method of modifying existing protocol layers of an existing
protocol stack, the protocol layers comprising one or more existing
software components, the method comprising the steps of:
loading a protocol stack into a run-time environment;
downloading at least one new software component;
45 loading the at least one new software component into the run-
time environment, wherein the at least one new software
component interacts with the existing protocol layers so as to

provide additional functionality to the existing protocol at run-time.

- 5 59. The method of claim 58 wherein the existing software components and the new software components comprise platform independent software instructions.
- 10 60. The method of claim 59 wherein the platform independent software instructions comprise Java™ or Java-like software instructions.
- 15 61. The method of claim 58 wherein the additional functionality is selected from the group of functionality comprising: software instructions, software profile, software module, software layer, API, object code file, software interface to hardware, class file, class file archive, security manager, file transfer protocol, object exchange protocol (OBEX), TCP/IP stack, synchronization profile, object push profile, dial-up networking profile, bug fix, patch, and LAN access profile functionality.
- 20 62. A device comprising:
a processor;
means for storing software components;
at least one application program executing on the processor;
at least two communication circuits, the communication circuits
25 transmitting and receiving binary information; and
at least two platform-independent communication protocol stacks for transferring software instructions between the at least two communication circuits and the at least one application program executing on the processor, the at least two platform independent
30 protocol stacks comprising software components stored on the means for storing, wherein each of the at least two platform-independent communication protocol stacks comprise instances of the same software components.
- 35 63. The device of claim 62 wherein the software components comprise one or more Classes.
- 40 64. The device of claim 63 wherein the Classes comprise Java™ or Java-like software instructions.
65. The device of claim 62 wherein the communications circuits are selected from the group comprising: Bluetooth, IEEE 802.11, GSM, IEEE 802.15, IrDA, 3GPP, 3GPP2, CDMA, or TDMA basebands.
- 45 66. The device of claim 62, wherein the communication circuits are selected from the group comprising: Ethernet, HomePNA, serial,

USB, parallel, Firewire, and SCSI communication circuits.

- 5 67. The device of claim 62, wherein the communications circuits
 comprise a first and a second baseband, wherein the binary
 information comprises a multimedia stream, the first baseband
 receiving a first portion of the multimedia stream, the second
 baseband receiving as a second portion of the multimedia stream.
- 10 68. The device of claim 67, wherein the first portion comprises video
 information and wherein the second portion comprises audio
 information.